CQ·TV 70

THE BRITISH AMATEUR TELEVISION CLUB

MAY 1970

THE BRITISH AMATEUR TELEVISION CLUB

64, Showell Lane,
Penn,
Wolverhampton,
STAFFORDSHIRE

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GENERAL INFORMATION

INTRODUCTION

The club was founded in 1949 to inform, instruct and co-ordinate the activities of amateur radio enthusiasts experimenting with T.V. transmission, and to liaise with other enthusiasts engaged on similar work overseas. The club is affiliated to the Radio Society of Great Britain and has a membership of about 1000. Of these, about one-third reside abroad; there is much activity at present in Australia, Canada, France, Belgium, U.S.A., Netherlands and India.

Experiments carried out by BATC members have been mainly in two directions; r.f. and video. As few members have the resources to build both sorts of equipment, many have combined to form constructional groups, to hold lectures, and to take part in local exhibitions. There are local groups of this type in various districts.

I. Waters — 1, St. Audrey's
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CLUB STANDARDS

On the video side, the standards recommended are such that a normal domestic 625 TV set can be used as a monitor, with waveforms similar to BBC-ITA. For interchangeability, members are recommended to arrange all video outputs at the one volt level, whites 0.7 volt positive and syncs 0.3 volts negative; pulses should be at the two volt level, negative going, and all impedances should be 75ohms. Belling-Lee plugs and sockets are preferred.

TRANSMITTING LICENCE

On the radio side the experimenter must hold a GPO amateur vision licence costing £2 per annum. Operation is permitted in the 70cm band. Full details can be obtained from the GPO Radio Branch,
St. Martins le Grand,
London, E.C.1.

SLOW SCAN

Another very popular branch of the hobby is slow scan TV. The line and frame scan rates (16⅔ Hz and 1 cycle per 7.2 secs) are sufficiently slow to permit pictures to be tape-recorded or transmitted using bandwidths of the order of 3 or 4 KHz. Full technical standards were published in C Q - T V 68.

CAMERA TUBES

Vidicon camera tubes rejected by the manufacturers for very minor blemishes are available to Club members and can be sent to any part of the world. Reject monoscopes are available, but can only be sent to members in U.K. A range of other equipment not readily available on the market, is held by the Club Sales Officer, and full details will be found on another page of this issue.

E D I T O R I A L

Have you ever thought about writing for C Q - T V ? About how you could let other members know about your projects and experiments.

Everything in C Q - T V is written by members. So if you have found a particular article interesting, just remember that someone else is probably keen to see what you have done.

Circuits, photographs, stories. If it's interesting we will print it!

So out with those pens and pencils!

And post the results (handwritten is OK, but we prefer circuits and diagrams 9½ inches wide, and photos semi-matt EN-Print size) to the Editor at the address on Page 1.

C O N V E N T I O N 1 9 7 0

Have you sent your registration form yet?

Copies were printed in the last issue, or are available from the Public Relations Officer.

Remember C A T - 7 0 is THE EVENT of the year - come and be a part of it.

July 25 through 26 are the days.

See you there!

S U B S C R I P T I O N S

Did you receive a subscription reminder with the last issue?

Have you returned it?

Please do.

A MODERN VISION MIXER

By David J. Taylor
G8ARV G6SDB/T

Many amateur television stations can radiate pictures from various picture sources (e.g. Flying spot scanner, camera, test waveforms), but switching between these sources may be rudimentary, even plug and socket changeover.

A vision mixer enables the sources to be cut or faded into one another and with the inlay unit pictures from two sources can be displayed simultaneously in different parts of the screen, so that a caption from the F.S.S. can be superimposed on camera pictures.

The overall idea is obtained from fig.1. As many inputs as required (i.e. no. of vision sources plus room for expansion) are fed into the unit. The inputs should be of standard amplitude as no gain adjustment is provided on individual inputs. This is 0.7v p.p.

A switching system then allocates each channel within the mixer (of which there are two) to the desired input. The two channels within the mixer are fed to the inlay unit, and the output from this unit together with the two channels is fed to three fader amplifiers.

The combined output is then fed to a Vision sync blanking mixer which produces the final composite output.

Circuit details are shown in figs. 2,3 and 4.

INPUT SWITCHING AND FADER AMPS

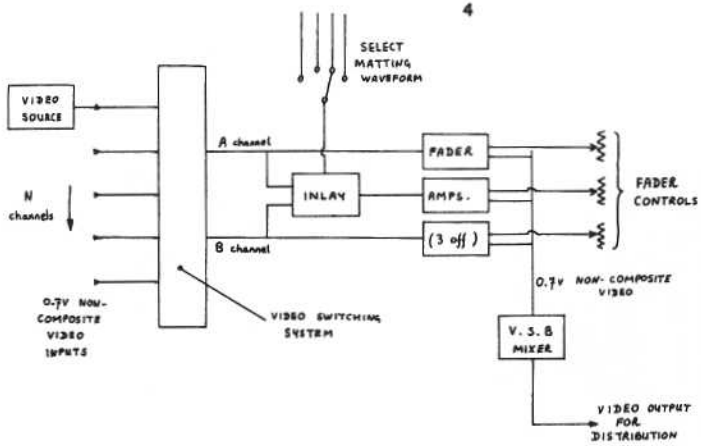
The inputs can be terminated if required by adding an 82 resistor as shown on input 5. This is desirable if the input is fed from a long length of coax cable, and of course if the mixer is the only load on the source. Push button switches are by far the best for the switching. Ideally, a three bank switch is required; one for each of "A" and "B" channel and one for selecting the matting waveform, but what is used will depend on what is available.

The set gain controls are adjusted so that the input to the V.S.B. mixer is 0.5v with a 0.7v input to the mixer and the appropriate fader set to maximum gain.

The fader amplifiers consist of differential pairs and the gain of the amplifier is varied by varying the d.c. through the pair. A forward bias on the emitters ensures that the amplifier gain can be reduced to zero. The use of the differential pair ensures low distortion of the picture waveform.

INLAY UNIT

The inlay unit is basically a high speed video switch. To achieve the required switching speed diodes are used. Before switching can take place the d.c. level of the signal must be restored and this is done by the clamp circuits. Emitter follower drives to the clamp ensures good clamping action. It was found that

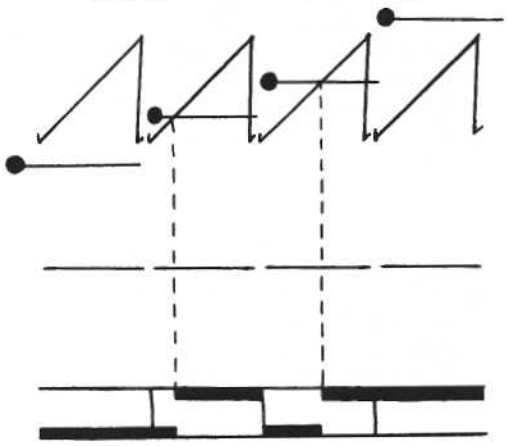


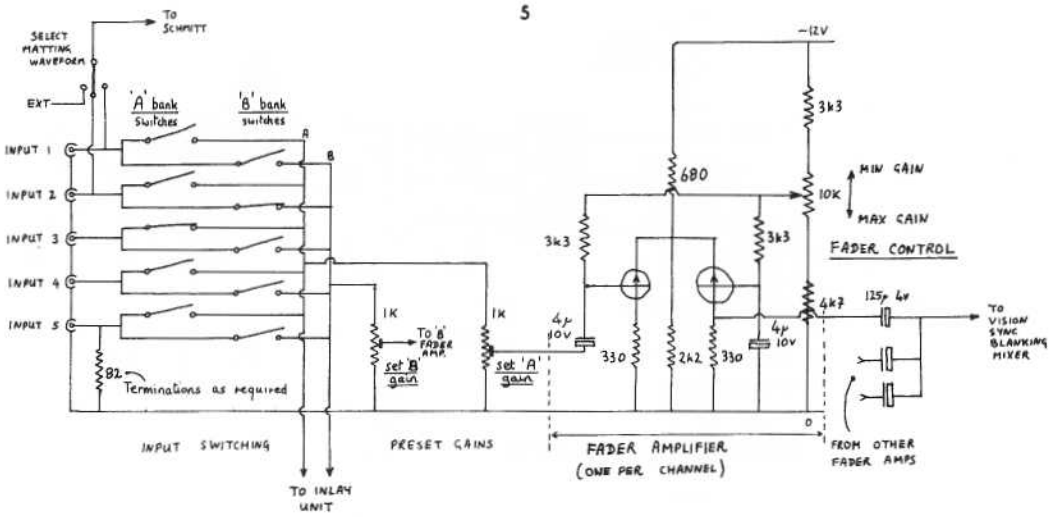
the 47K resistors from the collectors of the clamps to OV removed a slight amount of line tilt visible without them.

The Black level balance control ensures that the two clamping potentials are the same, and will allow balancing of small differences in the diodes.

Suppose that, at an instant in time, channel A is to be selected and channel B not. Then transistor B is non-conducting, which turns on diode 5 and off 4 and 6, thus opening the channel B path, and transistor A is turned on so that diode 2 is off and 1 and 3 conducting, so that the channel A path is connected through to the output. Drive for the driving transistors is provided by a Schmitt trigger so that a clean switching waveform is obtained irrespective of the input waveform. The 10K potentiometer enables the switching point to be selected. An example will make this clearer. Suppose line sawtooth is the switching (or matting) video input:
As the switching level(●——) is altered, the switching point varies so that with the slider of the pot at the -12 end the A channel is passed through the inlay unit and as the slider rises a slight amount of B channel will appear as a strip on the left of the picture. As the slider rises the familiar wipe effect is obtained, wiping from picture A to picture B with a left to right vertical line.

One may reasonably ask what matting waveforms to use. As sug-





G6528/T

VISION MIXER INPUT SWITCHING AND FADER AMPS.

21.12.69

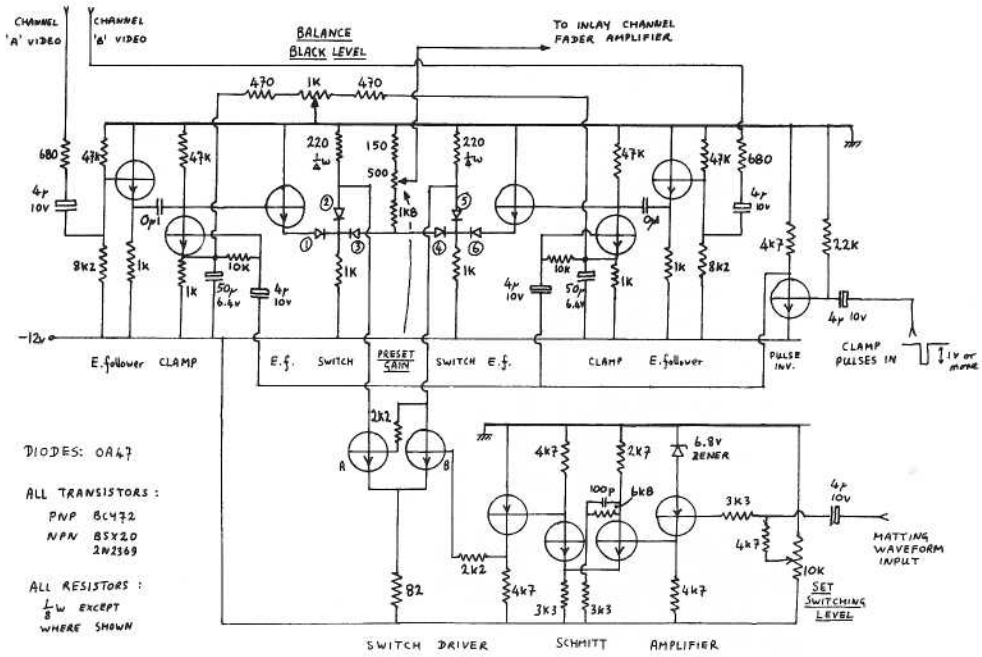
gested line sawtooth provides a vertical wipe, so frame sawtooth provides a horizontal wipe. Combinations of these provide diagonal wipes. Using synchronized and unsynchronized audio oscillators of various waveforms (triangular, sawtooth, sine parabolic) will give rise to a variety of matting effects with which viewers of "Top of the Pops" will be familiar. Synchronized oscillators give stationary switching patterns (sync'd to line or frame), non-sync oscillators give moving switching patterns.

Using a pulse generator locked to line and frame, a rectangular aperture can be created (and the two waveforms for an aperture or a cross). This aperture can be used to superimpose your call sign on a test card. Indeed, it seems that the BBC-1 test card is generated in this way from the BBC-2 test card.

Another category of switching is those generated from video waveforms from cameras. Imagine a scene set against a dark ground. Then the switching level could be set so that where video existed from the scene (i.e. in the light parts), then the scene was transmitted, and where video did not exist (i.e. in the black parts) then a suitable background could be added. This technique is used on T.V. news using a blue background and switching the video with the output from the blue channel as a matting waveform. In this way a slide can be superimposed behind the news reader.

VISION SYNC BLANKING MIXER (V.S.B. MIXER).

This is based on design by Mike Cox which appeared in C Q - T V 49 (observe it uses p.p. transistors which gives away its age). The



665DB/T

VISION MIXER INLAY UNIT

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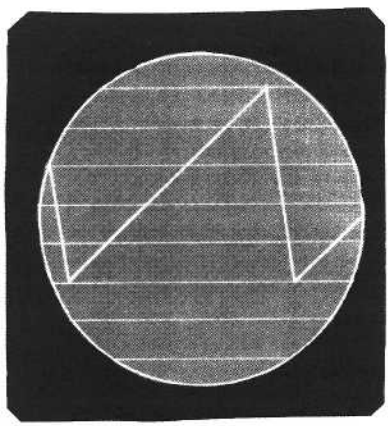
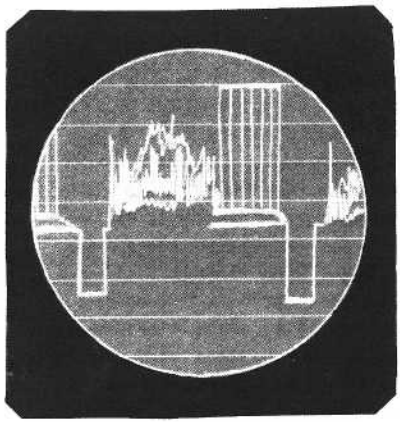
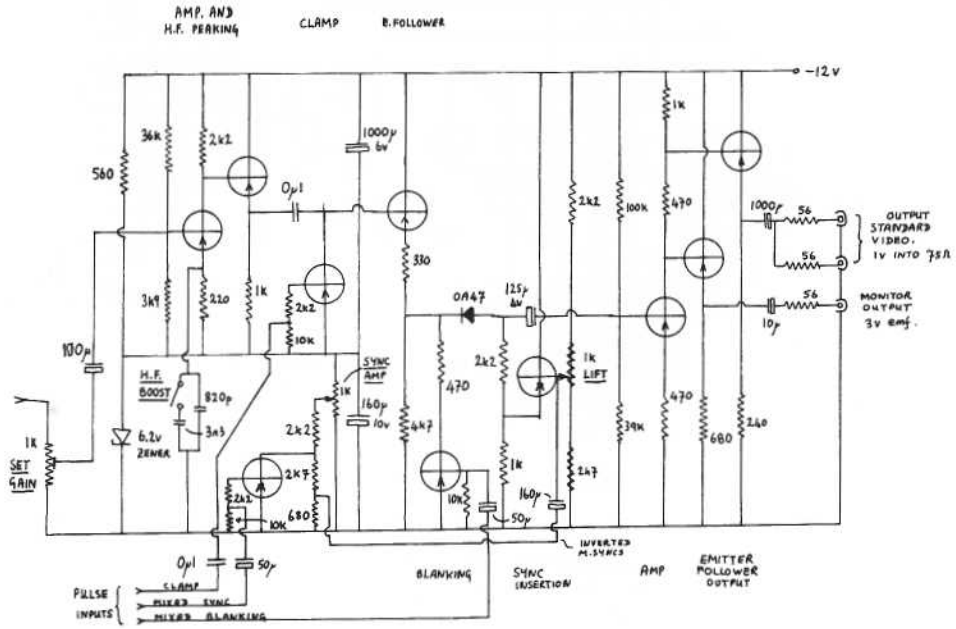


SWITCHING WAVEFORM



OUTPUT WITH A LINE WIPE HALF COMPLETED



G6SDB/T VISION MIXER Vision Sync Blanking Mixer 21.12.69

operation is similar to that described in C **Q - T V** 65 and 68. The only unusual feature is the output stage. The author has it convenient to have a 3vp.p. output available to drive unmodified domestic T.V. sets at the video grid, using the video detector diode as a d.c. restoring diode (405 only). However, if you use a Mothersole circuit (see Wireless World, May '64) you do not need d.c. restoring and a.c. coupling can be used throughout, and no brightness control resetting is required on 405-625 changeover. Two 75Ω outputs are provided as in the author's system the video apparatus sits in between the transmitter and the video monitor, so that it is easier to provide two separate outputs rather than have one cable going all the way to the transmitter and back to the monitor. The 56Ω resistor on the outputs ensures 75Ω sending impedance. Doing this ensures that any reflections from a **mis**match at the other end are absorbed at the mixer and not sucessively reflected.

For transmission purposes, it has been found advantageous to have an extra degree of **H.F.** peaking. Although this means that the picture on closed circuit appears to have

excessive H.F., the off-air results (particularly on weak signals) are noticeably improved. The 820pF capacitor is adjusted for optimum square wave response (look on monitor using a slight imbalance on the inlay black level balance control and sawtooth matting waveform). Suitable clamp pulses for this circuit and the inlay unit are line drives and none of the pulse amplitudes are critical. The gain, sync and lift controls are set to give standard video output when feeding a 75 termination, and using sawtooth input to the mixer unit.

The circuit in C Q - T V 68 should also be suitable as a V.S.B. mixer, but remove the gain control and associate 330Ω resistor. Then the present gain controls in the inlay and mixer unit can be set to give standard 0.7v of video out (+0.3v of sync) for 0.7v non composite video input.

TRANSISTOR TYPES

In the original, the V.S.B. mixer had already been built and used OC170 for video stages and GET874 for the pulse stages. If the design is built from scratch it is probably best to use the design from C Q - T V 68 and use BSX20 throughout. The PNP transistors can then be BCY72. BSX20 are particularly recommended as they are relatively cheap (as commercial transistors go), have a 500 MHz f_t, and also come in handy for convertor local oscillator chains and transistor transmitters (see Dec. 1969 "Radio Communications").

CONCLUSION

The unit described has been in use for about two years, and has given excellent service on 405 lines. A 625 line picture has been tried through the mixer and given acceptable results, and although exhaustive tests have not been carried out on 625 lines, the fact that I can see 4.5 MHz from 405 line cameras (using many volts on seperate mesh vidicon) augurs well for 625 line operation. No difficulties have been experienced with R.F. pickup, inspite of using 500 MHz f_t transistors.

I N T H E N E X T C Q - T V

A Transistor Television Transmitter

C A T - 70 in pictures.

DON'T FORGET

This year's CONVENTION at:
Churchill College, Cambridge.
Dates are 24th-26th July.

CIRCUIT

NOTEBOOK

No 4

AN I.C. TIMING GENERATOR FOR SLOW SCAN

By John LAWRENCE GW6JGA/T

The recommended standards for Slow Scan TV appear in C Q - T V 68 and for the U.K. are as follows:-
line period 60mS (50÷3=16.6 Hz)
field period 7.2 S (0.14 Hz)
lines per field 120
line sync pulse 5mS
field sync pulse 30mS

A timing generator for U.K. Slow Scan requires a ÷3 stage from mains frequency to provide the line sync and a number of divider stages giving ÷120 for field sync. It is convenient to include pulse-forming stages to give a line pulse of 5 mS and a field pulse of 30 mS.

The circuit shown includes these features and gives a line

The circuit shown includes these features and gives details of a suitable power supply.

The first stage consists of a bi-stable, I.C. 1a and b, driven at mains frequency by 6v from the mains transformer. This provides a 50 Hz square wave having a fast negative-going edge, suitable for driving the J-K flip-flops used in the ÷3 stage. The output of this stage drives the line sync pulse generator, providing a 5 mS pulse at 16.6 Hz rate. The ÷ 120 chain has division factors of 3, 5 and 8 (2x2x2) to give a field period of 7.2 seconds. The field pulse generator provides a pulse of 30 mS duration at the end of each field period.

Two types of Motorola MRTL I.C.'s are used, the MC724P is quad two input gate and is used for the 50 Hz bi-stable and pulse-narrower output stages, the MC790P is a dual J-K flip-flop and is used in the divider stages.

The consumption, of the whole unit, is about 220mA at 3.6 volts. The circuit of a suitable power supply is included in the diagram. VT2 has to dissipate about 1 watt and requires a push-on type of finned heat sink.

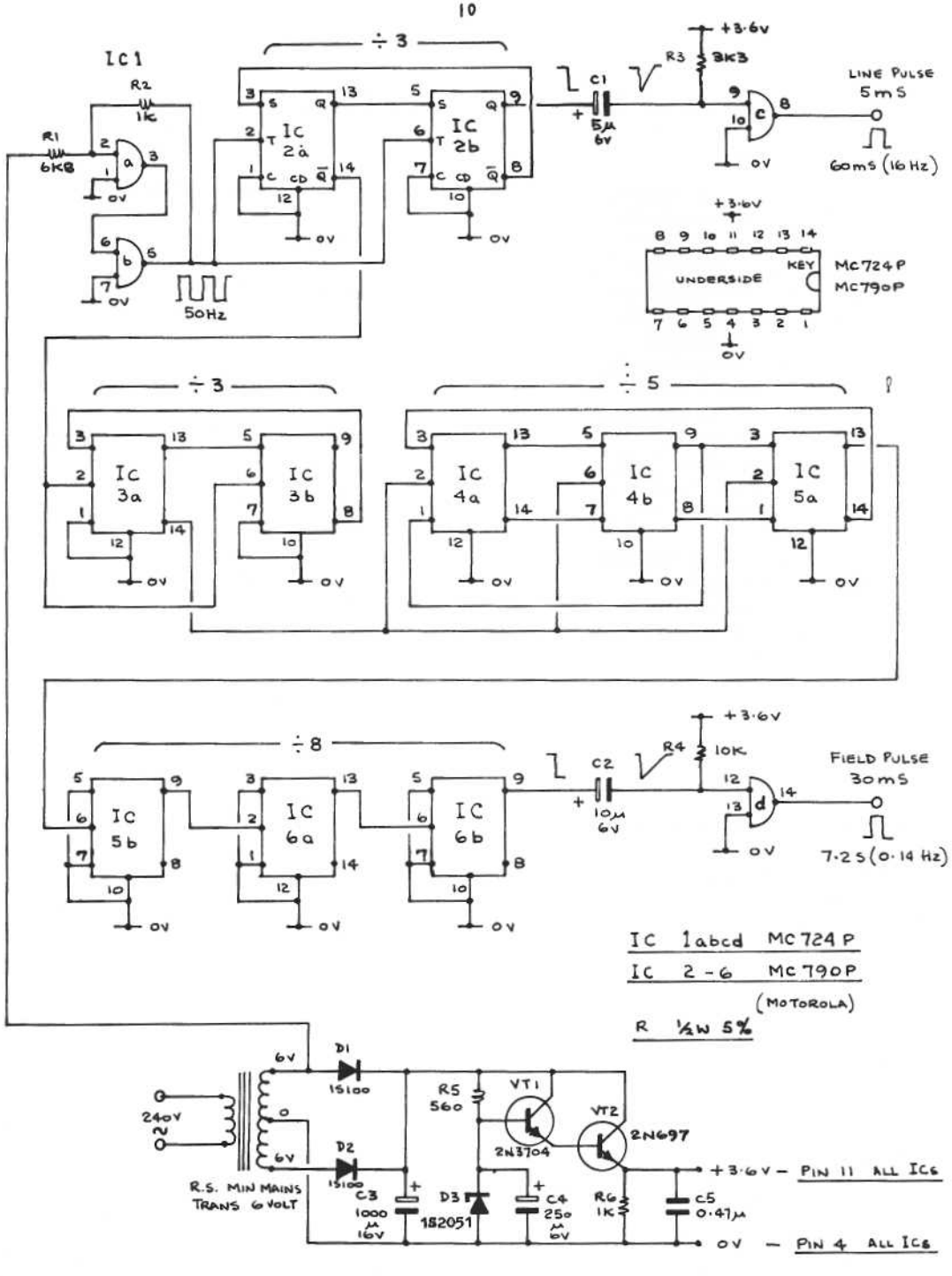
References

Slow Scan News. C Q - T V 68
page 14. B A T C.

Intergrated Logic Circuit Applications, (Mullard FJ Family) Pages 88-96.
Mullard Ltd., Torrington Place,
London W.C.1.

Data sheets MRTL MC790P Motorola.

Motorola Semiconductors Ltd.,
York House,
Empire Way,
Wembley, MIDDX.



IC TIMING UNIT FOR SLOW SCAN TV (UK STD) GW6JGA/T 2·1·70

LETTERS to the EDITOR

Dear Sir,

I am writing in connection with comments appearing under the heading "Slow Scan News" in the November 1969 issue of C Q - T V.

In the penultimate paragraph your contributor states the U.K. GPO have not been requested to allow slow scan on the h.f. bands.

This is incorrect. As far back as 1962 the R.S.G.B. obtained permission for slow scan on 28MHz on individual application. This facility was hardly used and the last permission expired on 31st March, 1968.

Before the Brussels 1969 IARU Conference I asked the U.K. GPO for details of existing licences for slow scan on 28MHz and they stated that no application had been received, either new or renewals.

If genuine applications for h.f. band working are received then I feel that the (now) Ministry of P. and T. will be willing to negotiate with the R.S.G.B. for the granting of suitable permission.

However, as with the amateur bands themselves, it is a question of use or lose!

Yours sincerely,

R.F. Stevens G2BVN.

R.S.G.B. London W.C.1.

Dear Sir,

Having read your article on Slow Scan TV on h.f. bands in the November 1969 C Q - T V this prompted me to try and find out more about this fascinating mode of long-distance communication, but until recently I have been unable to find any information on the sort of equipment required to start.

Then in the December 1969 edition of "Ham Radio" there appeared an article by Ralph E. Taggart WB8DQT on getting started on slow scan. From this I learned that all that is required for slow scan reception is a standard communications receiver and a slow scan monitor. The monitor simply plugs into the audio output of the receiver and it is also very interesting to note that the picture information can be taped on a standard recorder and subsequently played back through the monitor at a later date for perhaps photographic purposes, or just for pure interest. The article states that a readable picture can be resolved with only an S4 or S5 signal.

On the transmission side you require a standard SSB transmitter and the camera output simply plugs into the audio input socket.

My thoughts after reading this are that it would appear to be not too difficult to get going on slow scan (although we cannot transmit yet) and I'm sure that if more people knew just what is entailed, interest would soon grow in this country, and then we could approach the Ministry of P. and T. on the subject of air space.

So perhaps one of our more informed members would consider writing an article explaining in more detail just what equipment is required and also give us a circuit of a slow scan monitor.

I, for one, would be among the first to construct such a monitor if only the details were available, although I beleive such circuits have appeared in past radio magazines, however, relative newcomers like myself do not have access to back

copies of radio magazines of several years ago.

So how about it, someone?

Yours sincerely,

J.L. Wood G3YQC

Canterbury, KENT.

Dear Sir,

G8AYN has pointed out that the August 432MHz Open Contest scheduled for July 26th clashes with the B.A.T.C. Convention. This is rather unfortunate as no doubt some of your members would have otherwise taken part in the contest. Needless to say, the V.H.F. Contests Committee had no idea this would happen.

This committee has asked me to write, suggesting that you keep us informed of any similar events to come so that we can try to avoid them when planning contests for 1971. I realise it's a little early to be thinking so far ahead, but it soon creeps up on us!

I seem to remember hearing of a television contest some time back. I wonder if it materialized and how it went off? I dread to think of having to draft the rules!

Yours sincerely,

A.J. Gould G3JKY

Secretary, VHF Contests Committee, R.S.G.B.

London, W.C.1.

WHO YOU WILL MEET AT C A T - 70

Here are some of the faces you may see at Churchill College during the Convention. All of them are committee members who will want to help you feel at home, so don't hesitate to present them with your problems, ideas, thoughts etc.

Ian Waters

Andy Hughes

John Lawrence

Gordon Sharpley

Grant Dixon

There are more of course, but space prevents printing too many pictures at once. But come to C A T - 70 and see us all there.

HOW TO MAKE YOURSELF A CHEAP AND CHEERFUL DELAY LINE

By David Taylor - G6SDB/T G8ARV

The most important requirements for an amateur delay line are:

(a) it should be cheap

(b) the components should be easy to get, preferably from the 'junk-box'

(c) it should be simple

Requirements (a), (b) and (c) are compatible as will be shown.

The delay line I propose to describe meets the above and is suitable for pulse work.

Individual Sections

Each section is made up of an inductor and a capacitor. To meet requirement (b) the capacitor must be 1000 pF since not only are you likely to have a number of these, but also they are reasonably cheap. To obtain moderate bandwidth the delay per section is about 60nS, giving a cut-off frequency of 2.5MHz.

Knowing the delay and the capacitor 'C' we can calculate the 'L' for a section from:

$$L = \frac{(60 \times 10^{-9})^2}{1000 \times 10^{-12}} = 3.6 \times 10^{-6} = 3.6 \text{ uH}$$

If you happen to be like me you will not fancy winding the 25 inductors required for a 1.5 uS delay, and in fact my previous attempts at the problem have ended here. However, since I had bought 100 Mullard ferrite beads I decided to evaluate one of these as an inductor.

To my surprise $1\frac{1}{2}$ turns on one of these beads produces about 3uH inductance so it appeared that at last a suitable coil had been found.

A 24 section line constructed with the above components had the following characteristics (as far as I can measure):

(Using $1\frac{1}{2}$ turns on FX 1115 bead)

Impedance 55 ohms

Delay (total) 1.5 uS

Cost 10/5d (if you must buy all the parts)

As a matter of interest, calculated impedance is given by:

$$z_o = \sqrt{\frac{3.6 \times 10^{-6}}{1000 \times 10^{-12}}} = 60 \text{ ohms}$$

theoretical

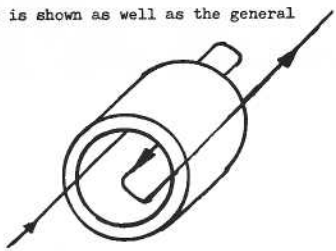
$$z_o = \sqrt{\frac{3.0 \times 10^{-6}}{1000 \times 10^{-12}}} = 55 \text{ ohms}$$

practical

The impedance was measured by determining the terminating resistance required for no reflection.

Constructional notes

The layout of the line is not critical. The method of winding $1\frac{1}{2}$ turns is shown as well as the general circuit of the line.



Useful formulae

For a line made up of N sections each of inductance L and capacity C

Time delay per section = $\sqrt{LC}$

Time delay for line = $N\sqrt{LC}$

Characteristic impedance = $\sqrt{\frac{L}{C}}$

Cut-off frequency = $\frac{1}{\pi\sqrt{LC}} = \pi \frac{1}{\text{(time delay) (per section)}}$

(A line is useful up to about half the cut-off frequency).

References

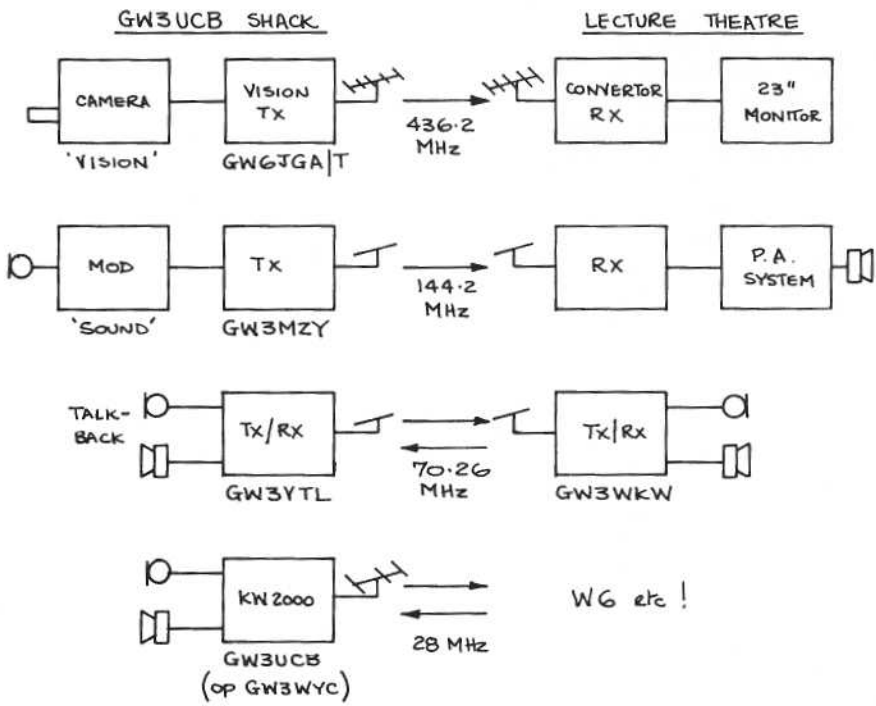
1. Use of delay lines - 'Television Engineering'
Amos and Birkinshaw, series published by Iliffe (4 vols).

2. Derivation of above formulae - 'Services Textbook of Radio'
Vol 5, p 47, Glazier & Lamont, HMSO, at 25/- a very good buy.

I hope I have presented some new and useful ideas and would be pleased to hear from anyone who builds such a delay line.

ERRATA

We regret that in C Q - T V 68 an article on page 17, by John Lawrence referred to a diagram which was never printed. Although a little late, here it is, with our apologies to John and all our readers for any inconvenience caused.



POSTBAG

I.J. Taylor G6AAA/T of Yately writes to tell us of his activity; at the moment a C Q - T V 68 SPG is being constructed, with suitable AAA/T modifications of course! And, yes, we will keep those C Q - T Vs coming!

P.J.C. Marlow G8BTV of Cheltenham is still at school, but isn't letting that stop his A.T.V. activity. After an early unsuccessful attempt to construct a receiver, he's now coming up with an FSS using a 3BPI and 93IA. Finances allowing, he should be on the air by the end of the year, and a vidicon camera is also planned.

Roland C. Hoffmann of Kanigswinter, Germany, is active in a group of amateurs experimenting with TV in Germany. Their journal is the "TV-AMATEUR" and we hope shortly to start exchanging articles between C Q - T V and TV-AMATEUR. Roland has sent us some information on some of the commercial equipment available in Germany- such as a Philips video tape recorder at 1850DM (£208). He hopes to visit U.K. in August and September and would like to visit ATV stations here and see how we do it.

P.C. Walker of Taunton is another who hopes to come on the air sometime this year. The transmitter is nearly finished and is based on the C Q - T V 64 design. An FSS is already completed, and a camera using the C Q - T V 65 circuit is also working. You don't mention an SPG, Peter- Why not build one next, we've published several in recent editions. Then, with synchronised sources, you could build and use this issue's vision mixer.

MAITLAND LANE VK5AO/T writes from Adelaide, Australia telling of the most recent events in A.T.V. there. Those who saw C Q - T V 63 will remember their first long distance effort- The latest was a two-way contact over 93 miles and has been registered with the Wireless Institute of Australia. Helical scan VT, PAL colour and outside broadcasts are all going strong "Down Under"- With Adelaide as the most active area, says Maitland.

T.D. SHEPHERD from Victoria, Australia, however, lives far from the two Australian "A.T.V. areas", the above and one in New South Wales. A chance to start a third group?

IAN NEWCOMBE, THORNEY ISLAND has built up a good selection of equipment, including an S.P.G., a video mixer using EF85s and a wipe generator using 6AC7s and 6AG7s. He's also converted a Ferguson 205 as a monitor and is experimenting with the Marconi Field Interlace system (see C Q - T V 59). When we last heard he was busy with a video and pulse distribution system. There's probably more now!

MARTIN ALLARD G3WFC G6AEM/T has been on the air since last August and would like to hear from anyone else active in Brentwood, Essex, and surroundig area. Martin can run 150 watts to a 4CX250B, positive or negative modulation with a parabeam antenna at 40 ft. Vision sources are a vidicon camera (from C Q - T V 65), an FSS using fully interlaced 405. 8mm telecine can also be rigged up and the vision frequency is 436.4. So anyone near Martin- His address is 57, Priests Lane, and he can be found as G3WFC on 144.68 most evenings- He wants contacts.

A.I. BEDELPH VK7AX/T of Tasmania is building a flying spot scanner and has created quite a lot of interest among hams in his area, and at least one camera has cropped up. Hope by the time this appears in print the scanner is completed, Tony.

ALAN POORE of Melksham, Wilts., has modified his colour receiver to 70cm - Can anyone transmit P.A.L. colour in his area? If so, Alan would like to hear from you. He hopes to be active on 144 soon, and has plans to transmit video one day using a home-made 16mm telecine.

Portsmouth Polytechnic Radio and TV Electronics Society has recently become affiliated to BATC - welcome Portsmouth! They'd like very much to meet local active /T amateurs, so if you live in the area, drop a line to the Society's Secretary, P.O. Wenham, at the Students Union Offices, St. Pauls Road, PO5 4AQ. The current activities include designing vestigial sideband filters (using the College computer), SPG and camera chain design and a P.A. system. And C Q - T V hopes to publish the results of their work! The Society is active on 80m to 10m, with 2m and 70cm to follow - 13 cm and 3cm are also in the pipeline.

Prof. Franco Fanti I1LCF of Via A. Dallolio, Bologna, Italy and, R.A. Gill G3CXP G6ADI/T of 45, Biggin Lane, Ramsey, Hunts. have both got FAX appartus and would like to contact any other amateurs who have also. So if any of you have, and are interested, please write to either of the above addresses.

Tony Griffiths G3MED of Banstead in Surrey, has recently been spending time trying to bring his tv up to "laboratory" standard, and hopes also to build a 14 inch slow scan monitor soon. He also offers some comments on the article on afterglow correction in C Q - T V 69. Afterglow causes a rounding of the top end of the leading edge just as it causes a rounding of the bottom of the trailing edge, says Tony, and the correction by means of RC networks compensates for this loss resulting in a good square wave. However Tony points out that no RC network can make a positive going edge go negative as shown in the second drawing in the article. Since the two networks described both give the same results, Tony recommends that the second be used as the first is very difficult to set up.

Willy P. Everaert ON4WM of Melle, Belgium, has written in about his slow scan activities. Having sold his Cop McDonald design monitor a year ago, Willy has now designed and built his own (mainly transistorised) SSTV system using digital circuitry. A pattern generator is integral with the limiter/detector/amplifier/filter/monitor which is also capable of providing pulses to a camera or F.S.S. which can be connected to the monitor. The whole is built on two separate chassis, each in its own aluminium case, and works on the American standard. Willy intends soon to start receiving broadcasts from weather satellites, and hopes to use the monitor as a display device; his first aim however is to get his own receiving and transmitting station onto a firm footing.

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C Q - T V

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CAT 70

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HELP WANTED

The Club would be pleased to hear from members who would care to lend a hand with any of the Club's book-keeping and secretarial duties. Offers of assistance, which would be greatly appreciated, should be made to the Secretary at the address on page 1.

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